2014

INGEN AWS

Automated Weather Station

INGEN Technologies Private Limited
Regd office: 369, A Chandel Gate Nankari, Kalyanpur, Kanpur- 208016
Corporate office: 148B, Housing Society, Near Gayatri Park, Lakhanpur, Kanpur - 208024
Unit office: KH No. 1114-1120, Salempur Rajputana Indl Area, Roorkee - 247667
Contact: (0512) 258 0381, **Email:** info@theingen.com

INGEN AWS, Ingen's Automated Weather Station provides continuous automatic observations on basic weather parameters like air temperature, humidity, dew point, sunlight intensity, short and long wave solar radiation, rainfall, wind speed and direction, soil temperature, soil moisture, water & snow depth, leaf wetness, barometric pressure, water flow rate etc. These parameters are the most crucial for weather monitoring.

The INGEN AWS comes in various shapes and sizes. The various components can be installed and erected in a modular format. The base structure is a variable size (from 2 m to 10 m) tripod or a tower made of galvanized iron/stainless steel to which various sensors are attached. The support fixtures and frames are made as per client's requirements. Please refer to the installation brochure for more details.

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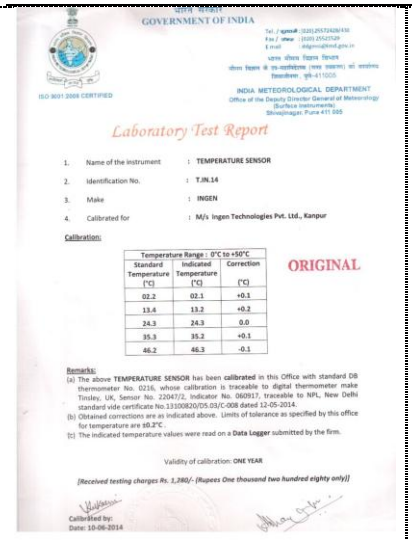
The INGEN AWS software generates weather messages automatically at a programmable interval. The messages are continuously sent to a central server through GPRS/GSM. In case of non-availability of GPRS signal, data is sent through SMS. In extreme case of no GSM signal, the data is stored in the internal memory which can be later retrieved manually. In case of institutional customers, daily data can be sent over email in any of the common formats such MS Excel spreadsheet, text or xml files. The customers can also login to our website for retrieving data. In case of specific requirements we also transmit data via VSAT following TDMA protocol at client recommended frequencies.

Built-in algorithms test each measurement to ensure data quality. For each parameter, tests are carried
out on parity, consistency, climate threshold basis. A built- in testing system also continuously checks the hardware, reporting immediately if a fault occurs.

Ingen sensing mechanisms use a wide variety of industry accepted technologies. Main measurement and sensing systems are mentioned below. For complete details, please refer the individual sensor data sheets.

- Air Temperature Sensor
- Humidity Sensor
- Rainfall Sensor
- Wind Speed Sensor
- Wind Direction Sensor
- Solar Radiation
- Atmospheric Pressure Sensor
- Soil Temperature Sensor
- Soil Moisture Sensor
- Leaf Wetness Sensor
- DWLR Sensor
- Evaporation Sensor

IMD Certification



GOVERNMENT OF INDIA

INDIA METEOROLOGICAL DEPARTMENT

Laboratory Test Report

1. Name of the instrument : TEMPERATURE SENSOR
2. Identification No. : T.IN.14
3. Make : INGEN
4. Calibrated for : M/s Ingen Technologies Pvt. Ltd., Kanpur

Calibration:

Temperature Range : 0°C to +50°C		
Standard Temperature (°C)	Indicated Temperature (°C)	Correction (°C)
02.2	02.1	+0.1
13.4	13.2	+0.2
24.3	24.3	0.0
35.3	35.2	+0.1
46.2	46.3	-0.1

ORIGINAL

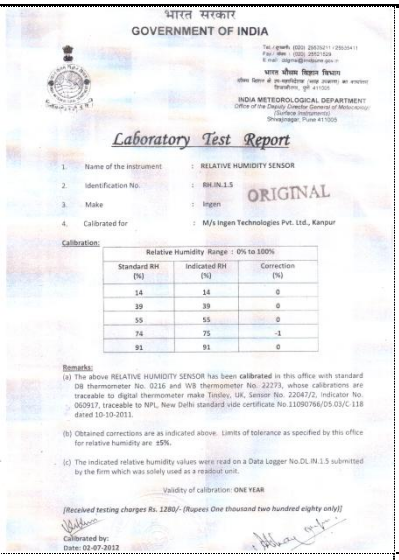
Remarks:
(a) The above TEMPERATURE SENSOR has been calibrated in this Office with standard DB thermometer No. 0216, whose calibration is traceable to digital thermometer make Tinsley, UK, Sensor No. 220472, Indicator No. 060917, traceable to NPL, New Delhi standard vide certificate No.11300820/D5.03/C-008 dated 12-05-2014.
(b) Obtained corrections are as indicated above. Limits of tolerance as specified by this office for temperature are ±0.2°C .
(c) The indicated temperature values were read on a Data Logger submitted by the firm.

Validity of calibration: ONE YEAR

[Received testing charges Rs. 1,280/- (Rupees One thousand two hundred eighty only)]

Calibrated by:
Date: 10-06-2014

Temperature Sensor



GOVERNMENT OF INDIA

INDIA METEOROLOGICAL DEPARTMENT

Laboratory Test Report

1. Name of the instrument : RELATIVE HUMIDITY SENSOR
2. Identification No. : RH.IN.1.5
3. Make : Ingen
4. Calibrated for : M/s Ingen Technologies Pvt. Ltd., Kanpur

ORIGINAL

Calibration:

Relative Humidity Range : 0% to 100%		
Standard RH (%)	Indicated RH (%)	Correction (%)
14	14	0
39	39	0
55	55	0
74	75	-1
91	91	0

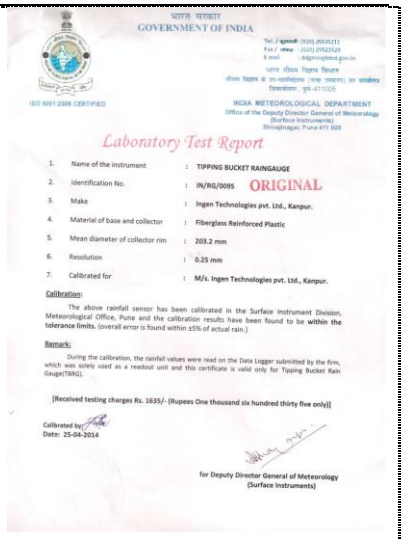
Remarks:
(a) The above RELATIVE HUMIDITY SENSOR has been calibrated in this office with standard DB thermometer No. 0216 and WB thermometer No. 22273, whose calibrations are traceable to digital thermometer make Tinsley, UK, Sensor No. 220472, Indicator No. 060917, traceable to NPL, New Delhi standard vide certificate No.11050766/D5.03/C-118 dated 10-10-2011.
(b) Obtained corrections are as indicated above. Limits of tolerance as specified by this office for relative humidity are ±5%.
(c) The indicated relative humidity values were read on a Data Logger No.DL.IN.1.5 submitted by the firm which was solely used as a readout unit.

Validity of calibration: ONE YEAR

[Received testing charges Rs. 1280/- (Rupees One thousand two hundred eighty only)]

Calibrated by:
Date: 02-07-2012

Humidity Sensor



GOVERNMENT OF INDIA

INDIA METEOROLOGICAL DEPARTMENT

Laboratory Test Report

1. Name of the instrument : TIPPING BUCKET RAINGAUGE
2. Identification No. : IN/RG/0095 ORIGINAL
3. Make : Ingen Technologies pvt. Ltd., Kanpur.
4. Material of base and collector : Fiberglass Reinforced Plastic
5. Mean diameter of collector rim : 203.2 mm
6. Resolution : 0.25 mm
7. Calibrated for : M/s. Ingen Technologies pvt. Ltd., Kanpur.

Calibration:
The above rainfall sensor has been calibrated in the Surface Instrument Division, Meteorological Office, Pune and the calibration results have been found to be within the tolerance limits. (overall error is found within ±5% of actual rain.)

Remark:
During the calibration, the rainfall values were read on the Data Logger submitted by the firm, which was solely used as a readout unit and this certificate is valid only for Tipping Bucket Rain Gauge(TBRG).

[Received testing charges Rs. 1635/- (Rupees One thousand six hundred thirty five only)]

Calibrated by:
Date: 25-04-2014

for Deputy Director General of Meteorology
(Surface Instruments)

Tipping Bucket RainGauge

GOVERNMENT OF INDIA

INDIA METEOROLOGICAL DEPARTMENT

Certificate of Test & Calibration

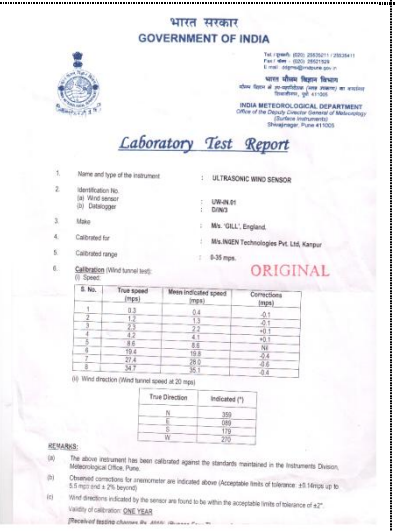
NAME OF THE INSTRUMENT	:	Silicon Pyranometer
IDENTIFICATION NO.	:	GR-IN-1-1
MAKE	:	Ingen Company, Kanpur
CALIBRATION FACTOR	:	10.52 μV W^{-1} m^2
RESISTANCE	:	54.95K ohms

PUNE
DATE: 10-05-2012

(R.K.Sharma)
Scientist – E

Note: The sensor is calibrated against thermoelectric type standard pyranometer whose spectral range is from 0.3 μm to 3.0 μm whereas this sensor is of silicon photodiode type whose spectral range is 0.3 μm to 1.1 μm. Hence the accuracy of the calibration is not guaranteed under all atmospheric conditions.

Silicon Pyranometer



भारत सरकार
GOVERNMENT OF INDIA

INDIA METEOROLOGICAL DEPARTMENT

Laboratory Test Report

1. Name and type of the instrument : ULTRASONIC WIND SENSOR
2. Identification No.
(a) Wind sensor : UW-IN.01
(b) Datalogger : DIN3
3. Make : M/s. 'GILL', England.
4. Calibrated for : M/s.INGEN Technologies Pvt. Ltd, Kanpur
5. Calibrated range : 0-35 mps.
6. Calibration (Wind tunnel test):

ORIGINAL

(i) Speed:

S. No.	True speed (mps)	Mean indicated speed (mps)	Corrections (mps)
1	0.3	0.4	-0.1
2	1.2	1.3	-0.1
3	2.3	2.2	+0.1
4	4.2	4.1	+0.1
5	8.6	8.6	Nil
6	19.4	19.8	-0.4
7	27.4	28.0	-0.6
8	34.7	35.1	-0.4

(ii) Wind direction (Wind tunnel speed at 20 mps)

True Direction	Indicated (°)
N	359
E	089
S	179
W	270

REMARKS:
(a) The above instrument has been calibrated against the standards maintained in the Instruments Division, Meteorological Office, Pune.
(b) Observed corrections for instrumeter are indicated above (Acceptable limits of tolerance: ±0.1kmps up to 5.5 mps) and ± 2% beyond)
(c) Wind directions indicated by the sensor are found to be within the acceptable limits of tolerance of ±2°.
Validity of calibration: ONE YEAR

Ultrasonic Wind Sensor

CERTIFICATE
QUALITY MANAGEMENT SYSTEM

This is to certify that the Quality Management System of:

Ingen Technologies Pvt. Ltd.

Regd. Office: 369 'A' Katiyaar House, Chandel Gate Nankari, IIT Kanpur, Kalyanpur, Kanpur - 208 016 (U.P.), India

Works Address: G-3 Sibdi Centre, IIT Kanpur Campus, Kanpur - 208 016 (U.P.), India

Has been assessed and found to comply with requirements of :

ISO 9001:2008

The certificate is valid for the following scope of operation:

Design, Development, Fabrications, Testing and Marketing of Electronic Circuits, Wireless Circuits, Sensor Circuits, Micro Processor Circuits, Robotic Equipments, Weather Station, Irrigation Station, Crop Surveillance Systems, Process Monitoring and Controls and Related Software Development and Consultancy

Date of Issue and Valid until : 18th May 2012 – 17th May 2015
Certificate Number : TR-Q-06-1056-165

Authorized — General Manager

Date — 18th May 2012

Surveillance Audit
2nd Year 17th May 2013
3rd Year 17th May 2014

The certificate is valid ONLY if the annual surveillance mark is present

TGA-ZM-01-07-00

KASCERT

ISO 9001:2008

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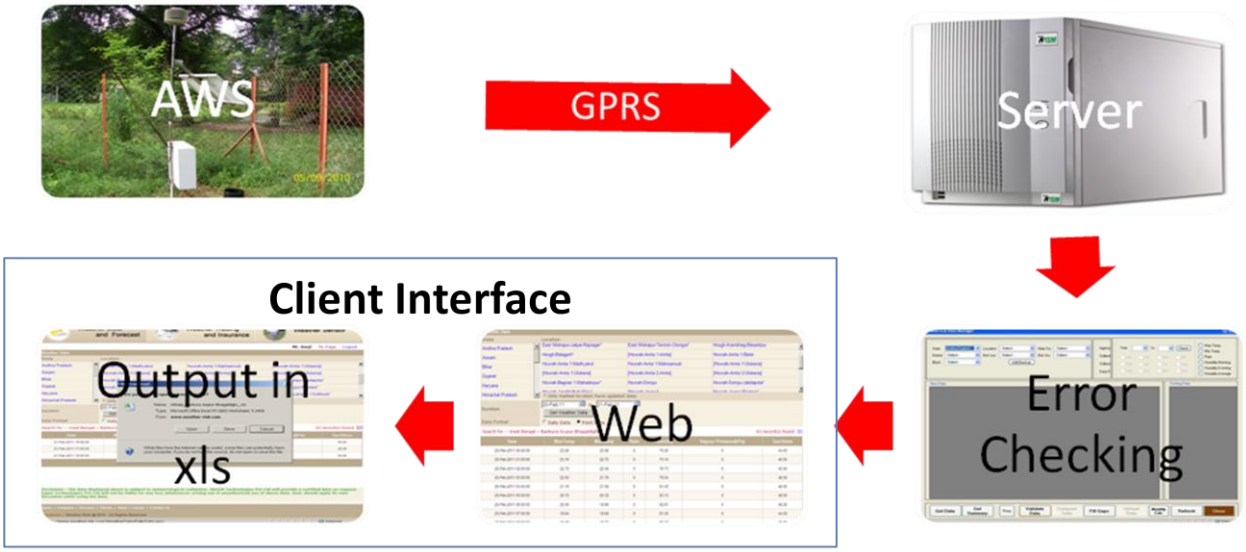
AWS Data Flow Diagram



Data output

Weather Data

Rajasthan	Alwar-Bahadurpur	Alwar-Kathumar	Alwar-Kathumar-Bhnokar
	Alwar-Kishangarh-Kherthal	Alwar-Kishangarh-Machrouli	Alwar-Kotkasim-kutubpur
	Alwar-Kotkasim-Pur	Alwar-Laxmangarh-Bichgawan	Alwar-Laxmangarh-GovindGarh
	Alwar-Laxmangarh-Moliya	Alwar-Rajgarh	Alwar-Rajgarh-KHOH
	Alwar-Rajgarh-Rajpurbada	Alwar-Rajgarh-Tehla	Alwar-Ramgarh-Bahala

Duration 08-Jul-13 to 08-Jul-13

Data Format Daily Data XML Point Data XML Get Weather Data

Search for :: Rajasthan > Alwar-Kishangarh-Machrouli Time : 0.234 sec. 96 record(s) found.

DateTime	MaxTemp	MinTemp	Humidity	Rainfall	Desc
08-Jul-2013 08:00	28.41	28.41	93.93	0	X
08-Jul-2013 08:15	28.96	28.64	91.84	0	X
08-Jul-2013 08:30	29.26	29.26	90.26	0	X
08-Jul-2013 08:45	29.69	29.49	87.75	0	X
08-Jul-2013 09:00	29.95	29.95	86.53	0	X
08-Jul-2013 09:15	30.38	30.1	83.74	0	X
08-Jul-2013 09:30	30.55	30.55	78.96	0	X
08-Jul-2013 09:45	30.58	30.53	77.28	0	X
08-Jul-2013 10:00	30.35	30.35	79.52	0	X
08-Jul-2013 10:15	30.25	30.13	80.86	0	X

1 2 3 4 5 6 7 8 9 10

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AWS Technical Specification

POWER REQUIREMENTS

Battery 12-65Ah/12V
Power consumption <500mA/12V
Battery can be charged through 230V AC (with suitable adaptor)
Or a 20W-75 W solar panel.

PHYSICAL SPECIFICATIONS

Materials: Stainless steel, Plastic, Anodized Aluminum
Height: 1.5 m to 10 m depending on requirement
Enclosure: 2* 2 sq m to 5*5 sq m
Weight : approx 7 kg – 20 Kg

ELECTRICAL COMPLIANCE

The INGEN AWS is in compliance with the provisions of the following EU directive(s), including the latest amendments, and with national legislation implementing this/these directive(s).

Low Voltage Directive
(73/23/EEC revised by 93/68/EEC)
EMC-Directive
(89/336/EEC revised by 91/263/EEC,
92/31/EEC, 93/68/EEC)
The following standards are complied with:
EN 60950 (1999-04)
EN 61326-1:1997 +Am1:1998,
Electrical equipment for measurement,
Control and laboratory use
EMC requirements
Generic environment
[CISPR16 class B,IEC 61000-3-2,
IEC 61000-3-3,EN 61000-4-2,
EN 61000-4-3,EN 61000-4-4,
EN 61000-4-5,EN 61000-4-6,
EN 61000-4-11]

All encasings are IP65V compliant. We also provide NEMA compliant boxes

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Technical Specification of AWS Sensors

iNGEN Temperature Sensor iTMS101-102

SPECIFICATIONS		
Sensor Type	**iTMS 101**:Band gap	**iTMS 102**: Resistance type
Measurement Range	-40°C to +120°C	-40°C to +120°C
Resolution	0.01°c	0.01°c
Accuracy	+ /- 0.2 °C (with radiation shield).	+ /- 0.1 °C (with radiation shield) or better
Repeatability	+/- 0.1°C	+/- 0.1°C
Response Time	1 sec	10 sec
Power Supply	3.3 V, 0.55 mA, 0.3µA Standby	3.3 V, 0.125 mA, 0.7µA Standby
Power consumption	80 uw	50 uw
Long term drift	<0.04°c/yr	<0.02°c/yr
Output Format	Digital	Digital
Proper encapsulation and weather shielding		

iNGEN Humidity Sensor iHMS101

SPECIFICATIONS	
Sensor Type	Solid State thin film capacitive Sensor
Measurement Range	0 to 100 %RH.
Resolution	0.03 %RH
Accuracy	+/-3.0 %RH or better.
Repeatability	+/- 0.1° %RH
Hysteresis	+/- 0.1° %RH
Output Format	<< 1 % RH (Linearized)
Response Time	1 sec.
Power Supply	3.3 V, 0.55 mA, 0.3µA Standby
Power Consumption	80 uw
Long term drift	<0.5 %RH/yr
Output Format	Digital
Proper encapsulation and weather shielding	

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iNGEN Wind Speed Sensor iWMS1011-13

SPECIFICATIONS			
Sensor Type	**iWMS1011:** Thermal	**iWMS10112:** Ultrasonic	**iWMS1013:**Optically scanned cup anemometer
Range	0 to 100 m/sec	0 to 60 m/sec	0 to 60 m/sec
Resolution	0.1 m/s	0.1 m/s	0.1 m/s
Accuracy	+/- 0.5 m/s	+/- 0.5 m/s	+/- 0.5 m/s
Threshold	0.5 m/sec	0.5 m/sec	1.3 m/sec
Response Time	immediate	immediate	immediate
Survival Range	120 m/s	100 m/s	80 m/s
Note: Thermal and Ultrasonic wind sensors can also be used for water flow measurement.			

iNGEN Wind Direction Sensor iWMS1021-24

SPECIFICATIONS			
Sensor Type	**iWMS1021:** Thermal	**iWMS1021:** Ultrasonic	**iWMS1021:** Propeller Vane
Range	0 to 359 Degrees	0 to 359 Degrees	0 to 359 Degrees
Resolution	1 degree	1 degree	1 degree
Accuracy	+/- 5 degrees	+/- 5 degrees	+/- 5 degrees
Threshold	0.5 m/s	0.5 m/s	0.5 m/s
Response Time	immediate	immediate	immediate
Obstruct range			
Survival Range	120 m/s	100 m/s	80 m/s

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iNGEN Solar Radiation Sensor iSRMS101-03

SPECIFICATIONS			
Sensor Type	**iSRMS101:** Precision Photodiode with on-chip trans impedance amplifier	**iSRMS102: :** Long range Photodiode with on-chip trans impedance amplifier	**iSRMS103:** Thermopile with spherical integrator
Range	0 to 2000 W/m2	0 to 2000 W/m2	0 to 2000 W/m2
Resolution	2.5 micro volt/ Watt/sq.m	2.5 micro volt/ Watt/sq.m	2.5 micro volt/ Watt/sq.m
Accuracy	1 watt/sq.m	0.5 watt/sq.m	0.5 watt/sq.m
Response time	< 10 sec	1 sec	1 sec
Spectral Response	300 to 1150 nm	900 to 3000 nm	300 to 2800 nm
Calibration traceability	World Radiometric Reference	World Radiometric Reference	World Radiometric Reference
Power Supply	5.0 V, 120 uA	5.0 V, 0.5 mA	5.0 V
Operating Temp	-30°C to +70°C	-30°C to +70°C	-40°C to +80°C
Long term drift	< 1% FS/yr	< 1% FS/yr	< 1% FS/yr

For **iSRMS103,** Sensor should combine two thermopile Pyrenometers for solar radiation measurement (incoming / reflected / albedo / balance) with two thermopile pyrgeometers for far infrared measurement (balance / ground surface temperature / sky temperature). There should be four separate signal outputs and the integrated temperature sensor should be used to calculate the downward FIR radiation.

SPECIFICATIONS	
Signal Outputs	2 (LW), 2 (SW)
Temperature Output	1 (LW)
Response Time 95 %	<18 Second(LW), <18 Second (SW)
Offset Type A	<15W/m2 (SW)
Offset Type B	<4W/m2 (SW), 4W/m2 (LW)
Window Heating Offset	<25 W/m2 (LW)
Field of View	180°
Direction Error	25 W/m2 (SW)

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Temperature Dependence of Sensitivity (-10 Deg C to 40 Deg C)	<4%(SW), <4%(LW)
Expected Output Range:	0 to 50 mV (SW), -5 to +5mV (LW)
Heater	12VDC, 6 W
Operating Temperature	-40 to +40° C

iNGEN Rainfall Sensor iRMS101-104

SPECIFICATIONS	
Material	Polycarbonate/thermoplastic/Stainless Steel
Range	0.5 mm to 900 mm or 450 mm (per hour)
Resolution	0.2mm - 0.25 mm
Accuracy	± 3% up to 300-350 mm/ hr intensity; +/- 5% for higher range
Sensor Type	Tipping bucket rain gauge or suitable sensor
Non-Contact Electromagnet Sensing, Easy calibration facility	
For colder regions, a heating rim is attached to melt the accumulated snow	

iNGEN Atmospheric Pressure Sensor iPMS1021-23

SPECIFICATIONS	
Range (single sensor)	600 to 1100 hPa
Accuracy	+/- 0.2hPa to +/- 1 hpa (depending on the model)
Resolution	0.1 h Pa
Sensor Type	Solid state
Response Time	1 sec

iNGEN Soil Moisture Sensor iSMMS101-102

SPECIFICATIONS	
Sensor type	TDR, FDR and dielectric
Measurement Type	Volumetric water content VWC
Range	0 to 100 % moisture
Resolution	0.1 VWC
Accuracy	+/- 5.0 %
Response Time	1 sec.
Depth of observation	15 cm – 300 cm depending on requirement
Compatibility	Interfacing capability with data logger
Soils	All Types, Coarse sand to Clay
Power Supply	12 V, <7 mA
Operating Temp	-40 To +70 °C
Operating Humidity	0 to 100%

INGEN Soil Temperature Sensor iSTMS101-102

SPECIFICATIONS	
Range	-20 to 60 deg c
Resolution	0.1 deg c
Accuracy	+/- 0.2 deg c
Sensor Type	Resistance
Response Time	10 seconds
Depth of observation	15 cm – 300 cm depending on requirement
Measuring Accuracy	+/- 5.0 %
Compatibility	Interfacing capability with data logger
Soil type	Can be used with all types of soil

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iNGEN Leaf Wetness Sensor iLWMS101

SPECIFICATIONS	
Operating temperature	-10 to +60°C
Unit	Dry/wetness duration in hours
Accuracy	+/- 0.5 hrs
Sensor Type	Capacitor plate
Response Time	1 second

iNGEN DWLR Sensor

SPECIFICATIONS	
Sensor Type	Vented Gage Submersible Pressure Transducer
Range	0 to 100 ft water level (can be extended up to 500 ft)
Resolution	+/-0.001% FSO
Accuracy	+/- 0.1% FSO
Response time	< 1 sec
Power Supply	12.0 V, 3.5mA
Operating Temp	-25°C to +70°C
Long term drift	< 0.1% FS/yr
Negligible hysteresis induced.	
High repeatability.	
Best SNR with programmable sampling at high frequency.	
Proper encapsulation and weather shielding (IP65)	

iNGEN Evaporation Sensor

SPECIFICATIONS	
Accuracy	+/- 2%
Operating Range	- 40 to 60 deg c

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iNGEN Integrated Data logger

Processor:

- ARM 32-bit Cortex™-M3 CPU
- 36 MHz, 45 DMIPS with 1.25 DMIPS/MHz
- 128 Kbytes of Flash memory
- 16 Kbytes of SRAM
- Dedicated 32 kHz oscillator for RTC with calibration
- Low power
- Communication Interface: timers, ADC, SPIs,I2Cs and USARTs
- 12-bit, 1 µs A/D converter (12-channels, +/- 1 LSB), Conversion range: 0 to 3.6 V
- 18 digital channels
- System Clock – Stability 1 ppm per year, real time clock synchronized with GPS
- Watchdog timer available
- Sample intervals – configurable from 1 sec to 24 hours with 1 second increment
- 16 Character or more, alphanumeric LED/LCD to operate in temp. range -10 ºC to + 55º C
- System Reset option available

Internal Memory: 1GB, extendable upto 8GB.

External Power: 8V to 20V DC (35 V maximum)

Power Consumption: Average per hour < 100mA/12V

Basic Communication Interface: RS232
Optional Communication interface: RS485, Ethernet, GSM, Zigbee,USB

Main Power option: 85V AC to 450V AC with suitable AC-DC adapter

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Operating Temperature: -40 °C to +60 °C

Operating Humidity range: 0% to 100%

INGEN Technologies Private Limited
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iNGEN Communication Unit (IDCU) for AWS iDAS101

Weather Station sends the summarized weather data at programmable intervals of 0.1/1/2/5/10/ 15 minutes: The messages are sent automatically via GPRS to the central server. In case of non-availability of GPRS signal, data is sent to the central server through SMS. In the extreme case of no mobile signal, data is stored in the internal memory unit having a capacity of 1GB sufficient to store 12 month weather data.

Communication: We guarantee for GSM/GPRS modules with:

- Proper IMEI number
- Fully IPR-paid for use of intellectual Property in using GSM/GPRS specs or patented.

The IDCU is able to intelligently prioritize data communication based on:

Priority of data transfer: For instance, ability to configure priority of communication for sensor data / alert / even log data
Network Availability: Auto-switch between SMS/GPRS during long periods of inactivity of a specific channel
Optimal Cost: Ability to configure size of data packet & connectivity options based on data usage plan offered by Network Operator

Secure Over-The-Air (OTA) Configuration, Firmware and Memory Updates:

All configuration parameters including recording / reporting interval and erasing of data will be configurable over-the-air (OTA). All OTA operations will be supported only from the authorized base station and not from any other mobile number(s). The IDCU shall support system configuration, firmware and memory updates through OTA

Data transmission through GPRS

- The IDCU is able to send the weather station data in a compressed format to the central server using secured HTTPS protocol.
- The data transmission interval will be configurable over the air and any new transmissions will happen as per the newly configured interval.
- Any failure in GPRS data transmission to the Primary IP will automatically attempt data transfer to the Secondary IP. Further failure will be intimated to the data server through the SMS alert.
- During a signal loss condition, the IDCU will keep trying for the transmission and resume the transmission once the GPRS network is available.
- The IDCU will allow the remote access from the base station to know the status of sensors and check log files through a software solution as required and shall have selectable options.

Optional Periodic Reporting via SMS (in the absence of GPRS coverage)

- The IDCU shall be able to send weather station information to the data server through SMS periodically.

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- The reported SMS will denote the unit id of the IDCU and the recorded data along with the other events or alerts (battery voltage, signal strength) noticed by the system.
- The IDCU will support a minimum reporting interval of 1seconds.
- The periodic interval will be configurable over the air (OTA) from the authorized base station.
- In case of GSM network unavailability the IDCU will store the messages internally and send the reporting message after the signal resumes.

Power Supply

The weather station is a standalone wireless unit powered by Solar Panel (20W to 75 W0 charged Battery of 12 V, 12AH – 65 AH. Solid Alkaline battery is preferred to ensure consistent power supply. Sensor can work for 6-7 days in extremely rainy weather with fully charged batteries.

Charged through appropriate Solar Panel or AC supply. Compatible with solar panels which have rated capacity of 20W - 75 W, Open Circuit Voltage – 21 V, Short circuit current 0.9 A -2.5 A , compatible with 12 V- 12 AH to 65AH lead acid battery; Internal Lithium battery (sufficient to store data for 2 years).

Application Software

Portal Software

Portal Software aggregates, manages, analyzes, organizes and distributes weather information into single system tailored to the preferences of the different users groups (farmers, agri officers, insurance companies, administrator etc).

It broadly does the following:

- Data acquisition (from IDCU)
- Data management & display (real time, history and forecast)
- Administrator (manage the web content based on the role based authorization model)
- Support section (statistics, SMS/ email alerts, data export etc)
- Resources – high speed networking, high performance computing and large data Storage

Forecast Model

Optional **Weather Research Forecasting (WRF)** model can be used for developing medium range forecast with six days lead time using one of the servers.

1. The latest version of WRF at the time of commissioning will be installed in the server.
2. The required pre-processor and post processing software for running the model from NCAR will be installed.
3. The latest version of Intel Fortran will be installed with at least three years update and technical support.
4. For data assimilation WRFDA and OBSGRID from NCAR will be installed for assimilating AWS data for 12 UTC hours.
5. The initial and boundary data of Global Forecasting System (GFS) at12 UTC will be downloaded from NCEP web site automatically everyday
6. The NCEP initial condition data will be updated with AWS data .
7. After post processing the data will be moved to database server and will be hosted in the web before 6:00 AM IST everyday and only for IST periods.
8. All the process of downloading GFS data, assimilating AWS data, running model, post processing and hosting in the web will be fully automated using scripts.
9. The model will be run at 3 KM resolution by nested domain and all the grid point forecast values of the main weather parameter (Maximum and Minimum Temperature, Rainfall, Wind speed, Relative Humidity.
10. The weather charts will be developed with district borders and the district charts depicting block borders.
11. Apart from block level data, provision will be made for the farmers to pick their area data from the grid points available.

Agro Advisory Services

SMS and Voice call based Agro Advisory Services which keep update the user as follows:

The farmers will be provided daily information on the weather status, prices and relevant agriculture news. Information on new products and services will also be provided. Other companies can advertise their products along with this information.

Research and Development

Dynamic calibration of Rain Sensor
Automatic cleaning of Rain bucket
Wind speed affect on Rain

AWS Warranty

The automatic Weather Station will come along with a one-year standard onsite manufacturer's warranty. We will be liable for any replacements necessitated due to internal malfunctioning of the equipment. However any loss due to hazardous weather, theft, external damage will not be covered by
the warranty.

AWS Service Support

As part of the Annual maintenance contract, Ingen will ensure that:

1. The AWS is in a working condition throughout the year.

2. The data is always available at a back-up server with 24*7 accesses.

3. Will ensure that that in case of a break down the sensors will be rectified within a period of 72 hours.

4. Attend to complaints raised by customer on daily basis.

5. The maintenance contract will include necessary repairs to the installed systems. Replacement of defective/damaged parts, components and other accessories is free of cost. However losses due to theft or physical damage will not be covered under the maintenance contract.

6. The maintenance contract also includes removal of virus, software patch updating, HDD crash recovery, system administration, network administration, software support /troubleshooting to keep the system fully operational and web site updated.

7. The contract will be initially for one year. The contract may be renewed for a further five years one year at a time, at the discretion of customer and based on satisfactory services provided by the agency.

8. The maintenance services will be provided on all working days from 0900 h to 1730 h (Monday to Friday). Provision of availability of service engineers on Saturdays, Sundays or other holidays will be made in case of exigency.